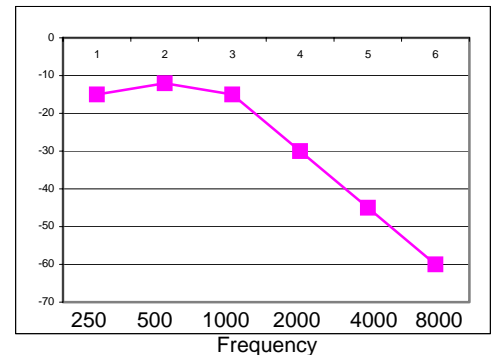


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1.0 Purpose/Scope

This procedure defines SHSD policy and provides guidelines for conducting Industrial Hygiene investigations and evaluations of identified Standard Threshold Shift (STS) changes in a worker's hearing by the Occupational Medicine Clinic. It is used in conjunction with the SBMS *Noise and Hearing Conservation* Subject Area and SHSD IH96 series procedures.

This SOP is restricted to use by IH Group personnel only. The IH Group provides professional assistance and commits to investigate every occurrence of STS when provided notification by BNL's Clinic, a division/department, or the Industrial Safety Group. The mechanism to insure that commitment will be inclusion of STS cases into the SHSD FATS systems with closure of conditions and actions when appropriate documentation is generated.

Investigations will be conducted to determine the work conditions of the affected employee and extenuating circumstances from non-work issues. The overall purpose of the investigation is to:

- identify site conditions, personal procedures, or PPE, which should be altered to minimize work related noise exposures; and
- determine the likelihood that the hearing shift may be work related.

Investigations will consist of:

- Initial interviews conducted with the line organizations supervisor and the affected worker to determine the need for, and extent of, follow-up monitoring.
- Review of the employee's department/division documentation on investigations of occurrences, if any.

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- Employee exposure assessments, if needed, with a sound level meter (SLM) or noise dosimeter.

The SLM measures instantaneous noise levels at specific locations whereas a dosimeter logs the exposure of the worker as they move through the work area. SLMs may be used to provide initial information for determining the need for personal dosimetry. The microphone of the dosimeter is clipped on the workers collar and closely represents the actual exposure of the ear to the noise source. Logged exposure data is compared to occupational exposure limits to determine compliance with hearing conservation regulations. SLMs are typically used in conjunction with dosimeters to provide additional information on the relationship between noise exposure and specific tasks as well as to verify dosimeter operation.

2.0 Responsibilities

- 2.1 Use of this SOP shall be limited to a competent hazard assessment person, such as an IH Professional (IHP) from SHSD.
- 2.2 Personnel that perform exposure monitoring shall act under the guidance of an IHP in accordance with this procedure and an *Instrument Operation* SOP for a particular meter. They are responsible to follow all steps in the various specific procedures.
- 2.3 The data collected under this procedure will be evaluated by the cognizant IHP designated to conduct the work.

3.0 Definitions

- 3.1 *Decibel (dB)*: A non-dimensional unit used to express sound pressure levels. It is the log of the ratio of the measured sound pressure level to a reference level.
 - *dBA*: A sound pressure level in decibels made on the A-scale of a sound level meter. This unit of measure approximates the response of the human ear.
 - *dB C*: Sound pressure based on a nearly flat, non-weighted scale.
- 3.2 *Occupational Exposure Limit (OEL)*: The maximum time weighted average (TWA) exposure permitted for employee exposure, based on the lesser of the current OSHA Permissible Exposure Limit (PEL) or ACGIH Threshold Limit Value (TLV):
- 3.3 *Standard Threshold Shift (STS)*: OSHA has defined an STS as a change in hearing threshold relative to the baseline audiogram of an average of 10 dB or more at 2000, 3000, and 4000 Hz in either ear.

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4.0 Prerequisites

4.1 Area Access:

- 4.1.1 Contact the appropriate Facility Support Representative or FS Technician to obtain approval to enter radiological areas.
- 4.1.2 Verify with the appropriate Facility Support Representative or FS Technician if a Work Permit or Radiological Permit is needed or is in effect. If so, review and sign the permit.
- 4.1.3 Contact the worker's supervisor to determine any specific PPE or training required for entry to the employee's work area.

5.0 Precautions

5.1 Hazard Determination:

- 5.1.1 The investigation does not create an exposure to any chemical, physical, or radiological hazards or generate Hazardous Waste.
- 5.1.2 However, the investigation will always include a site visit to the employee's work area where excessive noise levels exist or are suspected to be present. Exposures to noise levels above the PEL and/or TLV may cause temporary or permanent hearing loss. Exposures to other hazards will be evaluated on a case-by-case basis by the IH Professional.

5.2 Personal Protective Equipment:

In areas where noise levels exceed or are expected to exceed the *OEL*, hearing protection must be worn. The hearing protection should be used to reduce the noise levels below the *OEL*.

- 5.2.1 Additional PPE: Other appropriate PPE for hands, feet, skin, head, or eyes may be needed for the area being entered. Check with the area's supervisor, ES&H coordinator and FS Representative.

6.0 Procedure

6.1 Conducting an STS Investigation.

- 6.1.1 The IH Group Leader or designated representative receives and assigns the case to

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a specific IH Professional. The case is entered into the SHSD FATS system.

- 6.1.2 The assigned IH Professional reviews the notice of Illness/Injury Report provided by the Occupational Medicine Clinic and/or the Request for IH Field Services Follow-up from the Safety Engineering Group (see Attachments 1 & 2 respectively) and seeks additional information if needed.
- 6.1.3 The IH Professional contacts the worker's supervisor to set an appointment for the initial discovery meeting. The supervisor and employee may be interviewed separately or together, however, a single joint meeting is recommended.
- 6.1.4 During the interview(s), the IH Professional completes the Employee Noise Exposure Questionnaire (Attachment 9.3) to gather information on the current occupational exposure to noise, current non-work related exposure to noise (hobbies, second employment, etc), and past occupational and off-site exposure to noise (including military history).
 - 6.1.4.1 If further information is needed, the IH Professional contacts any necessary individuals and interviews them to collect the required data.
 - 6.1.4.2 The IH Professional searches IH database and formal reports to collect, review and verify previous monitoring meets current standards.
 - 6.1.4.3 The IH Professional identifies the hearing conservation group to which the employee belongs, if applicable.
- 6.1.5 Once the initial information is gathered and reviewed by the IH Professional, s/he determines if monitoring may be necessary.
Examples: (1) the employee has worked for the last two years in a quiet environment there may be no need to conduct monitoring; (2) if employee has worked in one location and there are one or more sources of potential exposure a sound survey and/or dosimetry may be required; and (3) if employee has worked in multiple locations with various exposure levels, extensive dosimetry may be required to fully characterize the workers exposure.

6.2 Evaluation and Report

- 6.2.1 Upon completion of the interviews, document review, and monitoring, the IH professional assesses the worker's typical exposure and prepares a written evaluation of the work area(s) and recommended response action(s).
- 6.2.2 At a minimum when exposures are found to be above the OEL, recommendations will include the follow-up procedures as stated in OSHA 29 CFR 1910.95 as follows:

| Condition | Response |
|-----------|----------|
|-----------|----------|

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| Employee not using PPE | a. Trained in hearing protector use and care b. Fitted with appropriate hearing protectors |
| Employee already using hearing protection | a. Refitted with appropriate hearing protectors b. Re-trained in hearing protector use and care c. Provided hearing protection with greater attenuation if necessary. |
| Employee needs additional testing or if medical pathology of ear may be caused/aggravate by wearing hearing protectors | Refer for a clinical audiological evaluation or otological examination as appropriate |

6.2.3 A copy of the incident investigation report is sent to the Occupational Medicine Clinic, the Facility Support Representative, SHSD Safety Engineering Group, SHSD IH Group Representative, ESH Coordinator, the affected worker, and his/her supervisor.

6.2.4 The IHP will provide re-training in hearing protection use (see Attachment 9.2) and document this re-training in the FATS closeout.

7.0 **Implementation and Training:** Training prior to using this procedure:

7.1 The SHSD IH Group professional is designated by the IH Group leader, as proficient to conduct the investigation based on demonstrated ability, education, and experience to:

- 7.1.1 define monitoring needs,
- 7.1.2 conduct or direct the field monitoring,
- 7.1.3 review the collected data,
- 7.1.4 provide a reasonable response action plan as necessary,
- 7.1.5 be familiar with the BNL N&HC Subject Area & IH hearing/noise related SOP's,
- 7.1.6 be familiar with procedures for accident/incident investigations.

7.2 For the SHSD IH Group personnel:

- 7.2.1 Qualification on this JPM is required on a 3 year basis, providing the professional is monitoring noise sources frequently.
- 7.2.2 Personnel are to document their training using the Attachment 9.5 with the *Job Performance Measure Completion Certificate: IH Group Member NHC Hazard Assessor* from IH96120.

7.3 Training for entry into restricted areas may be required (check with ESH coordinator or FS

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Representative for the facility).

- 7.4 Noise and Hearing Conservation Training and a Baseline audiogram may be needed if the exposure to the person performing the survey will be in excess of the OSHA Permissible Exposure Limits (PEL) or ACGIH Threshold Limit Value (TLV), which ever is less.

8.0 References

- 8.1 BNL N&HC Subject Area
- 8.2 OSHA Noise/Hearing Conservation Standard 29CFR1910.95.
- 8.3 NIOSH Criteria for a Recommended Standard-Occupational Noise Exposure, 1998
- 8.4 ACGIH American Conference of Governmental Industrial Hygienists Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices.

9.0 Attachments

- 9.1 SHSD: Employee Noise Exposure Questionnaire**
- 9.2 Employee Notification Form Of SHSD Evaluation Of Workplace Exposure**

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10. Documentation

| Document Review Tracking Sheet | | |
|---|--|---|
| PREPARED BY: <i>(Signature and date on file)</i> J. Peters Author Date 11/27/01 | REVIEWED BY: <i>(Signature and date on file)</i> R. Selvey SHSD IH Group Date 12/05/01 | APPROVED BY: <i>(Signature and date on file)</i> R. Selvey SHSD IH Group Leader Date 12/05/01 |
| Filing Code: IH96SR.01 | DQAR Date | Effective Date: 06/25/02 |

| Periodic Review Record | | |
|------------------------|--|---|
| Date of Review | Reviewer Signature and Date | Comments Attached |
| 06/25/02 | R. Selvey <i>(Signature and date on file)</i> | Added attachment 8.4 on STS employee notification and training on PPE use and fitting |
| 07/14/04 | R. Selvey <i>(Signature and date on file)</i> | Added and edited steps in Section 6. Edited Section 7 on qualification. Corrected error in Attachment numbering. Edited Attachment 9.3 |
| 06/16/05 | J. Peters <i>(Signature and date on file)</i> | Deleted Appendices 9.1 & 9.2; included documentation of re-training; revised reference to ESH standard with N&HC Subject Area; and added Dose to evaluation form. |
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The only official copy is on-line at the SHSD IH Group website.
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| BROOKHAVEN NATIONAL LABORATORY Safety & Health Services Division INDUSTRIAL HYGIENE GROUP | IH96175 Attachment 9.1 |
| Investigation/Evaluation of Standard Threshold Shifts | |

Attachment 9.1

SAFETY AND HEALTH SERVICES DIVISION EMPLOYEE NOISE EXPOSURE QUESTIONNAIRE

| | | | | | |
|---|----------------------|--|---|-------------------------|---------------------------|
| EMPLOYEE NAME _____ LAST INITIALS | | DIVISION _____ | DATE STS STS _____dB | INTERVIEW DATE _____ | BNL LIFE# _____ |
| CURRENT AMBIENT SPL RANGE _____dB(A) | SLM BNL# _____ | HC PROGRAM PARTICIPANT? <input type="checkbox"/> YES <input type="checkbox"/> NO | SUPERVISOR _____ LAST, FIRST INITIALS BADGE # | | PHONE _____ |
| REQUESTOR _____ LAST, FIRST BADGE # | | SHSD INVESTIGATOR _____ LAST, FIRST INITIALS BADGE # | | | |
| Job Title: _____ How Long? _____ Job Description: _____ Does the employee work in areas or use equipment that employee considers loud or that is labeled as a hazardous noise area? <input type="checkbox"/> Yes <input type="checkbox"/> No If yes, please describe. | | | | | |
| Location/Equipment | Duration | Frequency | Ave. SPL | Continuous/Impact | |
| _____ | _____ | _____ | _____ | _____ | |
| _____ | _____ | _____ | _____ | _____ | |
| Comments/Controls: _____ | | | | | |
| Was the employee exposed to loud noises on previous jobs? <input type="checkbox"/> Yes <input type="checkbox"/> No If yes, please describe. | | | | | |
| Date | Type of Job | Equipment | Duration | Frequency | Ave. SPL Cont/Impact |
| _____ | _____ | _____ | _____ | _____ | _____ |
| _____ | _____ | _____ | _____ | _____ | _____ |
| Comments: _____ | | | | | |
| Has the employee been exposed to traumatic noise (e.g. gunfire, explosion) in past six months that the employee considers loud: <input type="checkbox"/> Yes <input type="checkbox"/> No If yes, please describe: _____ | | | | | |
| Has the employee had current or past military service noise exposures: <input type="checkbox"/> Yes <input type="checkbox"/> No If yes, please describe: _____ | | | | | |
| Is the employee right or left-handed? <input type="checkbox"/> right <input type="checkbox"/> left | | | | | |
| Does the employee use hearing protective devices: <input type="checkbox"/> Yes <input type="checkbox"/> No. If yes, what type? <input type="checkbox"/> Muffs <input type="checkbox"/> Plugs <input type="checkbox"/> Both. Specify the listed NRR _____dB, and the adjusted NRR _____dB. | | | | | |
| Is the attenuation afforded appropriate for the noise level and frequencies, i.e., reduces the ambient noise below 85 dB? <input type="checkbox"/> Yes <input type="checkbox"/> No If no, what is recommended? | | | | | |
| What is the condition of the PPE? Is it worn correctly ? | | | | | |

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Attachment 8.3 SAFETY AND HEALTH SERVICES DIVISION EMPLOYEE NOISE EXPOSURE QUESTIONNAIRE (page 2)

| Occupational Exposures | Yes | Exposure Duration | Non-occupational Exposures | Yes | Exposure Duration |
|--|-----|-------------------|------------------------------|-----|-------------------|
| Grinding | | | Hunting/shooting | | |
| Power Tool Operation | | | Power tool operation | | |
| Chain saws | | | Chain saws | | |
| Grass Cutting | | | Grass cutting | | |
| Generators/pumps | | | Model airplane flying | | |
| Compressors | | | Powered watercraft operation | | |
| Metal working machines | | | Metal working machines | | |
| Woodworking | | | Woodworking | | |
| Impact equipment/air driven | | | Air driven tools | | |
| Earth moving equipment | | | Farm machinery | | |
| Hammering activities | | | Hammering activities | | |
| Shop vacuum | | | Shop vacuum | | |
| Explosions/firearms | | | Scuba diving | | |
| High pressure discharges | | | Loud music/concerts | | |
| Ventilation systems | | | Flying, non-commercial | | |
| Compacting equipment | | | Contact sports | | |
| Communications equipment | | | Motor vehicle racing | | |
| Other | | | Other | | |
| Additional Comments: _____ _____ | | | | | |
| Based on field review, SHSD <input type="checkbox"/> Recommends , <input type="checkbox"/> Does not recommend a comprehensive noise evaluation. Evaluation scheduled for: Date _____ | | | | | |
| Historical exposure monitoring data: Area sound level at work position _____ dBA, Personal exposure _____ dBA as 8 hr. TWA, Date: _____ Area sound level at work position _____ dBA, Personal exposure _____ dBA as 8 hr. TWA, Date: _____ Area sound level at work position _____ dBA, Personal exposure _____ dBA as 8 hr. TWA, Date: _____ Comments: _____ _____ | | | | | |
| Current Exposure Evaluation Results: Area sound level at work position _____ dBA, Personal exposure _____ dBA as 8 hr. TWA, Date: _____ ACGIH 8 Hour Dose _____ Area sound level at work position _____ dBA, Personal exposure _____ dBA as 8 hr. TWA, Date: _____ ACGIH 8 Hour Dose _____ Area sound level at work position _____ dBA, Personal exposure _____ dBA as 8 hr. TWA, Date: _____ ACGIH 8 Hour Dose _____ Comments (include information regarding impact and peak exposures) _____ <input type="checkbox"/> Include employee in the similar exposure group (SEG) specified as _____ <input type="checkbox"/> No SEG exists for this job activity. | | | | | |
| Determination: SHSD determined that the subject employee <input type="checkbox"/> does , <input type="checkbox"/> does not have the potential to be exposed at or above the 8 hr. TWA <input type="checkbox"/> standard of 85BA , <input type="checkbox"/> peak exposures >140 dB on one or more days per week. The employee <input type="checkbox"/> is , <input type="checkbox"/> is not required to be in the hearing conservation program on the basis of job related noise exposure. Periodic noise monitoring <input type="checkbox"/> is , <input type="checkbox"/> is not required. Interviewer: _____ Date: _____ | | | | | |
| IMPORTANT: Send copy to Occupational Medicine Clinic & SHSD Safety Engineering Group when investigation is in response to an STS. | | | | | |

The only official copy is on-line at the SHSD IH Group website.
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Attachment 9.2

EMPLOYEE NOTIFICATION FORM OF SHSD EVALUATION OF WORKPLACE EXPOSURE

(See next Page,
2-sided form)

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| BROOKHAVEN NATIONAL LABORATORY Safety & Health Services Division INDUSTRIAL HYGIENE GROUP | IH96175 Attachment 9.2 |
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EMPLOYEE NOTIFICATION FORM OF SHSD EVALUATION OF WORKPLACE EXPOSURE

| | |
|-------------------------------|-------------------------|
| Employee Name: | BNL Number: |
| Industrial Hygiene Evaluator: | Evaluator Signature: |
| Date: | IH Service File Number: |

The Occupational Medicine Clinic notified the Industrial Hygiene Group of BNL's Safety and Health Services Division that you received a hearing test and the results indicate a significant threshold shift (STS) in your hearing acuity as defined by the current Occupational Safety and Health Administration (OSHA) criteria.

The IH Group conducted an evaluation of your current and past work place conditions (job responsibilities and exposures) as well as use of personal protective equipment through interviews with you and your supervisor. Ambient and personal noise monitoring was conducted as necessary to determine the extent to which the workplace may currently contribute to any loss and a determination report has been provided to the clinic.

- ☐ It has been determined that the loss does not appear to be work related and no additional measures are recommended. (i.e. workplace exposures did not exceed occupational exposure limits)
- ☐ It has been determined that the loss may have been work related, however, exposures above the BNL occupational exposure limits are not anticipated in the future.
- ☐ It has been determined that the loss may be work related and you may still be exposed above the BNL occupational exposure limits. The following recommendations regarding the proper use and care of personal protective equipment are provided to assist in lowering future exposures.

| Condition | Response |
|---|---|
| Employee not using PPE | a) Train in hearing protector use and care (see reverse side) b) Fit with appropriate hearing protectors |
| Employee already using hearing protection | a) Re-fit (see reverse side)) b) Re-train in hearing protector use and care (see reverse side) c) Provide hearing protection with greater attenuation |

The following information is presented to assist you in using earplug and earmuff, hearing protection properly. For additional information or instruction in using other types of PPE visit the BNL Industrial Hygiene web site or contact the IH Group.

(over)

BROOKHAVEN NATIONAL LABORATORY
Safety & Health Services Division
INDUSTRIAL HYGIENE GROUP

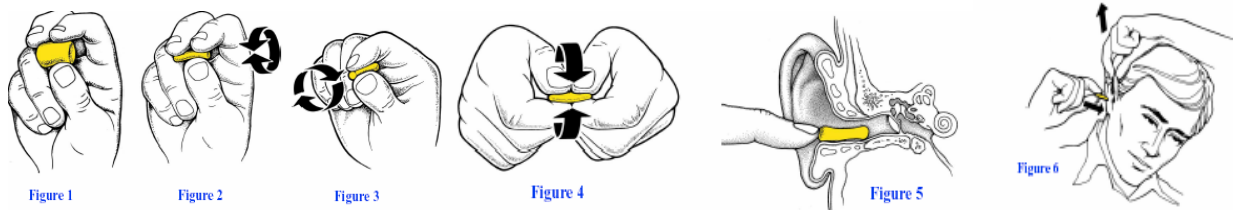
IH96175
Attachment 9.2

Investigation/Evaluation of Standard Threshold Shifts

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EARPLUGS: The Roll Down: Preparing A Foam Earplug For Insertion

Hands and plugs should be clean prior to use. Begin by rolling the plug into a very thin crease-free cylinder. The cylinder should be as small in diameter as possible, that is, *as tightly compressed as you can make it*. Do not worry about hurting the plug — it is designed to be compressed in this way. Crease-free rolling is accomplished by squeezing lightly as you begin rolling, then applying progressively greater pressure as the plug becomes more tightly compressed. Make sure you roll (not twist), the plug into a cylinder rather than any other shape such as a cone or a ball. The plug is best rolled between the fingertips. One method is illustrated in Figures 1 and 2, with an alternative in Figure 3. Another option, for those with less finger strength, is to use the thumbs and forefingers of both hands as shown in Figure 4.



Once the plug has been properly rolled and compressed, immediately insert it well into the ear canal. The importance of compressing the plug tightly is that insertion into the ear canal can only be achieved when the plug's diameter is less than the canal's. The plug then slides easily into place (Figure 5). As with all earplugs, fitting is easier if the ear canal is straightened and enlarged by pulling the outer ear (pinna) outward and upward during insertion (see Figure 6). Pull the pinna firmly, usually in the direction the ear extends from the head. Don't just press it flat against the skull.

Plugs should be inserted into the right ear using the right hand and into the left ear with the left hand. The pinna should be pulled with the opposite hand by reaching behind or over the head. This allows the hand inserting the plug to have the best line of approach for proper fitting.

After insertion, hold the plug in place with a fingertip for a few moments until it begins to expand and block the noise. Once a plug has begun to expand, neither pushing nor twisting it will improve its fit. If the initial fit is inadequate, remove the plug, re-roll it, and try again. Occasionally when a foam plug is first inserted, it may be slightly uncomfortable if fitted deeply. Wait 30 seconds or so for it to expand to see if the discomfort subsides; if not, withdraw the plug slightly.

EAR MUFFS: Proper placement and use limitations.

Headband should be on top of head for best results. Ear cup cushions must fit well around temples of eyeglasses. Best results are obtained when the temple bar of glasses are not covered. Remove excess hair from under the ear cup cushions. Do not bend, alter or modify any part of the headband, cups, inserts or ear cup cushions. Ear cup cushions that are hardened or damaged should be replaced. Follow manufacturer's instructions for cleaning, care and maintenance. When earmuffs are correctly worn, your voice should sound muffled to you as if you are talking inside a barrel.



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Investigation/Evaluation of Standard Threshold Shifts